(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 705 119 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
27.09.2006 Bulletin 2006/39

(51) Int Cl.:
B65B 11/02 *(2006.01)* ***B65B 11/58*** *(2006.01)*

(21) Application number: **06111039.1**

(22) Date of filing: **13.03.2006**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(30) Priority: **25.03.2005 IT BO20050191**

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(54) Ring machine for wrapping loads with stretch film

(57) A ring machine, for wrapping with stretch film palletized, comprises:
- a ring (5), which is made to rotate by drive means (9) mounted on a frame (2) which rotatably supports the said ring by means of support rollers (3) and containing rollers (4);
- means for supporting the reel (24) of stretch film and means for unwinding from it the film and for statically supplying it to:
- conveying means situated on the said rotating ring (5) and controlled by drive means, for collecting the film supplied from the said static supplying means, so as to accumulate it in the form of annular turns superimposed on each other in an amount greater than that with which the innermost turn of this winding is supplied to the load to be wrapped (C), by supplying means situated on the said rotating ring (5);
- means (27) for temporarily retaining on the load to be wrapped the front end of the film unwound from the said last supplying means.

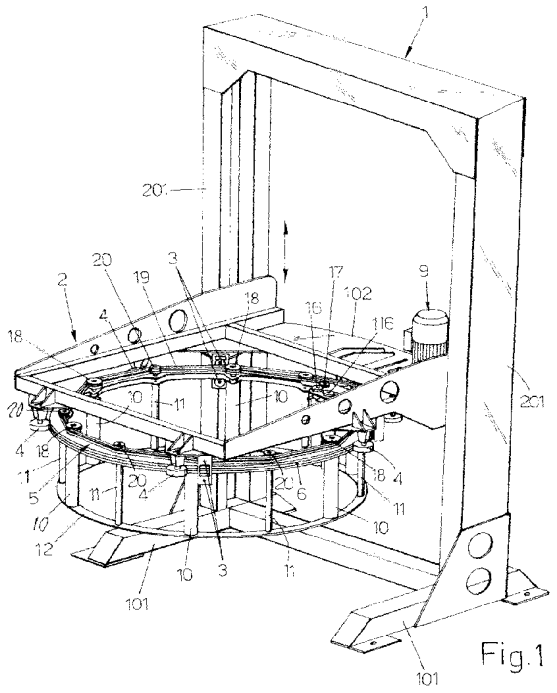

Fig.1

EP 1 705 119 A1

Description

[0001] The present invention relates to ring machines for wrapping loads which are usually palletized, with stretch film, so as to firmly fix the said loads on the support pallet and impart to the whole assembly a rigid condition suitable for transportation and storage. In the machines in question, the carriage which supports the reel of stretch film, the rollers for pre-stretching the film unwound from the reel and usually a jockey device with means for retroactive control of the movement imparted to the said pre-stretching rollers, travels together with or on a horizontal, round, annular structure which is fastened to a support structure via raising and lowering means and in the centre of which the load to be wrapped with helical turns of the said pre-stretch film is positioned. The front end of the wrapping film is initially retained by a gripper device with associated cutting means, which may be arranged in a fixed position, on the side of the load or which may be associated with the structure which supports the ring. In this type of machine, the motor of the pre-stretching unit and the safety devices situated on the rotating carriage are connected to a fixed power supply and control panel by means of a slip ring, for example with a plurality of brushes associated with the said carriage and cooperating with corresponding annular electrically conductive tracks which are mounted with conventional electrical insulation coaxially on the said ring when the said carriage moves along it. In order to be able to use these machines in the sectors of the industry which require a high degree of insulation of the electrical systems it is required to provide the said slip ring and brushes with fluid-tight qualities, which give rise to design problems, increase the production costs of the machine and result in the need for frequent quality checks. In order to simplify the fluid-tight design of the slip ring, in some cases the latter is made with small dimensions and is arranged so as to be coaxial with the ring and at a height higher than that of the maximum vertical travel of this component on the cross-beam of the gantry structure with the means for guiding and raising/lowering the said ring, and the small movable element of the slip ring is connected to the carriage with the pre-stretching rollers and with the reel, by means of electric wires guided in an arm in the form of an overturned L, the vertical branch of which has a telescopic form.

[0002] In other machines of the known type, an electric generator is mounted on the carriage with the pre-stretching rollers or on an oppositely arranged carriage which also performs dynamic balancing functions. Said generator is activated with the rotation of the carriage and forms a buffer power supply for an electric accumulator, so as to provide the electric power necessary for activation of the motor for the pre-stretching rollers without any external connection, also because the entire control and operating logic is mounted on the moving element.

[0003] In all the ring wrapping machines of the known type the following drawbacks are encountered:

a) All the machines have a moving element which rotates together with the pre-stretching rollers and with the on-board reel and in some cases with other parts as well and which has an overall weight which is not negligible, with inertia-related problems, and which limits the speed of wrapping of the load to values which on average are not greater than 60-65 rpm;

b) In order to overcome the drawback mentioned in the previous paragraph, a reel of limited weight and therefore limited autonomy is mounted on the carriage, so that it is frequently required to replenish the carriage with a new reel of film, in some cases using costly automatic reel-changing devices, in order to reduce the machine downtime;

c) The film unwound from the reel undergoes a single pre-stretching operation, with elongation in general not greater than 200-250%.

[0004] The invention intends to overcome the drawbacks of the prior art mentioned above with a ring machine able to operate at an average speed of about 80 rpm and also higher, to use reels of film with a large diameter and therefore a high autonomy and to subject the film to a first pre-stretching step, a subsequent rest (elastic memory return) step and a second pre-stretching (re-stretching) step, with overall elongation of the film equal to about 300% and also more. It has been possible to achieve these important results with the followed proposed solution. The large reel of film, together with the first motor-driven pre-stretching rollers, are arranged on the raising/lowering frame which supports the ring and therefore are in a static position, so that their weight does not pose a problem. The ring is mounted rotatably on the said raising/lowering frame and is made to rotate by a motor which is arranged statically on the said raising/lowering frame. The ring has, mounted thereon, a plurality of vertical rollers which are partly rubberized and partly smooth and are directed downwards, the rubberized rollers among them being connected together by means of a chain or other suitable means, with associated pinions and with an independent drive system, similar to that for rotation of the ring, all the said rollers being driven in a suitable direction and at a suitable speed. At a small distance from one of the rubberized rollers, a pair of rubberized rollers is provided, these also being driven by the said synchronization chain, but with a ratio such that at least one of these rollers rotates at a peripheral speed higher than that of the upstream roller. The film unwound from the reel is pre-stretched by the said pair of first static pre-stretching rollers, is deposited outside the said rollers supported by the ring, exits from the said pair of second pre-stretching rollers supported by the said ring and reaches a support gripper arranged in a known manner on the side of the load to be wrapped. In order to wrap the palletized load, the ring is made to rotate and with each revolution wraps the said load with a turn of film which has been pre-stretched by the said two pairs of

pre-stretching rollers. Since the diameter of the palletized load to be wrapped is always much less than that of the ring of the machine, during rotation of this ring around the load to be wrapped, the film accumulates on the rollers of the said ring and may remain on the latter for the time necessary for recovery of its elastic memory such that it may undergo the final second pre-stretching operation before wrapping of the load, so as to reach the overall stretching percentages mentioned above. The film collecting rollers situated on the rotating ring of the machine rotate at a speed which is controlled by the motor in the static position and which depends on the shape and on other requirements of the palletized load to be wrapped and which, during rotation of the ring, may vary automatically so as to keep at predetermined values the tension of the film during the final load wrapping step. This adjustment may be performed automatically by means of software which takes into account the characteristics, the shape and the size of the load, these being entered in each case into the program manually and/or using autodidactic means.

[0005] Further characteristic features and the advantages arising therefrom will emerge more clearly from the following description of a preferred embodiment thereof, illustrated purely by way of a non-limiting example, in the figures of the accompanying plates of drawings, in which:

- Fig. 1 is a perspective view of the machine without certain components;
- Fig. 2 shows a top plan view of the machine, complete with the various driving systems and with the film during unwinding from the reel and during wrapping of the load;
- Fig. 3 shows a perspective and enlarged view of the details relating to the main driving systems of the machine;
- Fig. 4 shows a side elevation view of a detail of the driving system for the motor-driven rollers of the machine.

[0006] In Figures 1 and 2 it can be seen that the machine comprises a robust gantry structure 1 with a base 101 which is designed for stable fixing on the ground and which has, sliding on its uprights 201 in a vertically guided manner, controlled by means of a raising/lowering drive system which has not been shown in that it is known, the wide transverse side 102 of a quadrangular and horizontal frame 2 which, for example, projects in cantilevered fashion from one side of the structure 1 and which, by means of horizontal-axis pulleys 3 and vertical-axis pulleys 4, rotatably supports underneath it a ring 5 which is also horizontal and in the centre of which and underneath which the load C to be wrapped is positioned, said load, as shown in the example of Figure 2, being moved in the direction of the arrows A by special motor-driven rollerways, not shown in that they are also of a known type.

[0007] The ring 5 has on its outer side a groove 105 inside which at least one belt 6 of the reinforced and closed loop type is seated, said belt embracing this ring substantially over the entire circumference, except for a small section along the cross-beam 102 of the frame, where the said belt follows a U-shaped path as a result of being deflected over a pair of pulleys 7 which are supported freely rotatably by the said cross-beam 102 and a pulley 8 which also has a vertical axis and is keyed onto the shaft of an electric motor 9, which is preferably of the type with electronic speed and phase control, for example of the brushless type, mounted on a bracket which is also supported by the cross-beam 102. As a result of rotation of the motor 9, the ring 5 rotates for example in the clockwise direction indicated by the arrow F in Figures 1 and 3.

[0008] Internal lugs 205 of the ring 5, which are angularly spaced equidistant from each other and are for example twelve in number, have, rotatably mounted on them, the shafts of vertical rollers 10 and 11 which are identical in height and directed downwards and which, at their bottom end, are interconnected by a ring 12 which is coaxial with the upper ring 5 and which has the function of supporting the said rollers against the centripetal stresses resulting from the residual elasticity of the film which is deposited on the said rollers 10, 11 (see below). The rollers 10 are rubberized and have the same diameter, for example about 90 mm, while the rollers 11 are made of steel, are smooth and have a diameter the same as or less than that of the said rubberized rollers. The rollers 10 and 11 are arranged alternately with each other so that a rubberized roller is followed by a smooth roller and so on. The smooth rollers 11 are idle, while the rubberized rollers are driven so as to rotate at the same speed and in the same direction F1 as the direction F of rotation of the ring 5. For this purpose, the top end of the shafts of the rollers 10, as also shown in detail in Figure 4, have, keyed onto them, pinions 13 on which a chain 14 is driven, said chain circumscribing said pinions and being kept suitably tensioned by a tensioning device described further below. In order to keep the chain along the plan-view dimensions of the ring 5, in Figures 2 and 3 it can be seen that the said chain 14 is also driven over idle pinions, not visible, which are arranged freely rotatably on the ring 5 at the top of the smooth rollers 11, for example making use of an extension of the shaft of the rollers as a support. From the detail shown in Figure 2 and Figure 3 it can be seen that, between one rubberized roller 10 and a neighbouring smooth roller 11, the ring 5 has internally a lug 305 which is larger than the lugs 205 and which rotatably supports the shafts of a pair of rubberized rollers 15, 115 which are vertical and close to each other and which, for example, have characteristics the same as those of the rollers 10, the shafts of these rollers having, keyed thereon, pinions 16, 116 with a different number of teeth, on which the said chain 14 is driven so that the roller 115 rotates in the same direction F1 as the rollers 10, the roller 15 rotates in the opposite direction and the roller 115 rotates at a speed greater than that of the roller 15 (see below). In Figures 2 and 3,

17 denotes the idle and adjustable pinion which ensures that the chain 14 has the correct longitudinal tension. The pinion 16 is, for example, identical to the pinions 13 so that the rubberized roller 15 rotates at the same speed as the rubberized rollers 10. As shown in the detail of Figure 4 and as can be seen from the other illustrative figures, the rubberized rollers 10 finally have, keyed onto their shafts, pairs of pulleys 18 on which corresponding pairs of elastic belts 19 are driven externally, said belts forming a closed loop and also being driven on pairs of idle pulleys 20 which are situated on the ring 5 along the shafts of the smooth rollers 11, so that the rotation performed by the said belts is as far as possible similar to a circle (see below). Opposite the cross-beam 102 of the frame 2, the pairs of belts 19 follow a U-shaped path as a result of being deflected over two pairs of pulleys 21 which are supported idly by the said cross-beam 102 and as a result of passing over a driving pulley 22 keyed onto the shaft of an electric motor 23 with speed and phase control, for example of the brushless type, which is also fixed onto the said cross-beam 102. As a result of rotation of the electric motor 23, the pairs of elastic belts 19 are made to rotate in the same direction F of rotation as the ring 5 and at a speed such that the rubberized rollers 10 rotate at the correct speed in the direction of the arrow F1. The polygonal non-round shape of the section of the belts 19 driven on the pulleys 18 and 20, whenever the set of these pulleys passes in the vicinity of the static pulleys 20, 21, produces on the said belts 19 small cyclical variations in the longitudinal tension which are easily compensated for by the elasticity of these belts 19.

[0009] Underneath the cross-beam 102 means for supporting a reel 24 of stretch film and for the controlled unwinding therefrom of the film 124 are mounted together with at least one pair of rubberized vertical rollers 25, 125 of the known type, with an associated drive system 26, for performing longitudinal pre-stretching of the film 124 in accordance with known parameters. The pre-stretched film leaving the first pre-stretching rollers 25, 125 is deposited on the rollers 10 and 11 in the direction indicated by the arrow F, until it reaches the last smooth roller 11, after which it is driven along a winding path between the last pre-stretching rollers 15, 115 and is finally secured to a moving element 27 of the known type situated alongside the path of the palletized load C and fixed for example on the side of the rollerway for conveying the said load or fixed for example to one of the uprights 201 of the gantry structure 1. This moving element 27 comprises a gripper for retaining the film, comprises means for fixing the tail end of the film onto the wound material and cutting means for separating the said tail end of one turn from the new front end of the film which is retained by the said gripper for the following working cycle. The pre-stretched film which has been stored on the rollers 10 and 11 of the rotating ring 5, 12 is kept with the width which it has when leaving the first pre-stretching rollers as a result of transverse gripping with the rubberized rollers 10 and, remaining stationary on the said rollers 10 and 11, gradually reacquires elastic memory so that it may undergo a final pre-stretching operation by the last rollers 15, 115 when the machine is started up. Upon start-up of the machine, as a result of the action of the motor 9, the set of rings 5, 12 starts to rotate in the clockwise direction F when viewing Figure 2, at a peripheral speed suitable for requirements of the load wrapping process. The rotating structure 5, 12 with the accompanying rollers is very light so that there are no problems of inertia either during start-up or during the final stoppage stage.

[0010] During rotation of the ring 5, 12, as a result of activation of the electric motor 23, the rubberized rollers 10 are made to rotate in the direction of the arrow F1 at a speed such as to take up, with or without correct longitudinal tensioning, the pre-stretched film leaving the pre-stretching roller 125 and such that film leaves the final pre-stretching rollers 15, 115, further stretched in the longitudinal direction, in an amount and with the longitudinal tension necessary for wrapping the load C. The motor 23 may rotate at a constant speed or at a variable speed, so as to produce a variable supply of film from the final pre-stretching rollers 15, 115, depending on the characteristics and/or the shape and/or the size of the load to be wrapped. These variables may be introduced with suitable means into the working program of the machine or the latter may be equipped with means and with an autodidactic program, at least as regards the shape and size of the load. Since these variations in speed of the motor 23 would produce variations in accumulation of the material on the rollers 10, 11, special means are envisaged for connecting together electrically the shafts of the motors 23 and 26 or for ensuring that the first pre-stretching rollers 25, 125 are operated with driving power obtained from the motor 23. It is also possible to envisage the presence, downstream of the final pre-stretching rollers 15, 115, of a mechanical jockey device with one or more rollers. The weight created in an eccentric position on the ring 5 by the final pair of pre-stretching rollers 15, 115 and by any jockey device may be conveniently counterbalanced by a ballast weight 28 situated on an inner lug 305' of the said ring 5, in a position diametrically opposite to the lug 305 with the said rollers 15, 115.

[0011] Owing to the fact that there are no unbalanced loads mounted, the ring assembly 5 is able to rotate at speeds much higher than those of the prior art and even as high as about 80 rpm and more.

[0012] It is clear how, owing to the considerable difference between the diameters of the ring 5 and the load to be wrapped, during use of the machine the rollers 10 and 11 tend to accumulate increasingly more pre-stretched film which has plenty of time to rest and recover the elastic memory which allows it to undergo the final pre-stretching by the rollers 15, 115, so that the overall elongation of the film may reach values of about 300% or even more, with all the advantages resulting from this condition. In order to obtain these advantages also when loading a new reel of film into the machine, it is also possible for the loading cycle of the said machine to envisage

a preliminary step during which the front end of the film is not fixed to the gripper 27 but is temporarily fixed to the roller 115, while the motor 23 is made to rotate at a speed such that the rollers 10 and 11 do not rotate about their axis, with the sole aim of accumulating on these rollers a suitable amount of pre-stretched film from the first pair of rollers 25, 125 so that this film has the time to rest and reacquire sufficient elastic memory for the final re-stretching step. Subsequently the front end of the film will be fixed to the gripper 27 and the machine will be ready to start operation.

[0013] It is clear how the improved pre-stretching and the large diameter of the reel 24 positioned on the cross-beam of the frame 2 ensure that the machine has a long operating autonomy, with wrapping costs much lower than those of the prior art, also because a large-diameter reel of film costs a lot less than the quantity of small reels needed to achieve overall the same number of meters of film as the said large diameter reel.

[0014] Wrapping of the load is completed with the known steps of raising and lowering the frame 2, so that the palletized load is wrapped by one or more helically wound turns of film which are partially superimposed on each other. During the final step, the film will be gripped again by the gripping, cutting and fixing unit 27 and the wrapped load may be removed and replaced by a new load to be wrapped.

[0015] It is understood that the improvements described here must be regarded as protected also for horizontal-axis ring machines for wrapping loads horizontally. It is also understood that the description relates to a preferred embodiment of the invention to which numerous constructional variations and modifications may be made. One of these modifications may for example relate to the fact that driving and synchronization of the rubberized rollers 10 may be performed in a different manner using a ring with internal teeth which meshes with pinions keyed onto the shafts of the rollers 10 and which has externally a groove so as to be able to be actuated by the static motor 23 by means of a belt, in the same manner as the ring 5. The final pre-stretching rollers 15, 115 could obtain their driving movement from the closest of the rubberized rollers or from a dedicated pinion, via any suitable positive drive transmission. According to a further modification, the idle rollers 11 may be rubberized so as to help maintain the transverse dimensions of the pre-stretched film. For this same object, as illustrated by means of broken lines in Figure 4, the rollers 10 and 11 may be designed to support and drive the external belts 29 or a single band or web, so as to form a continuous-surface conveyor which is made of suitable material with a suitable coefficient of friction in relation to the film and on which the said film rests and is thus prevented from performing both transverse and longitudinal contracting movements. Differently from that shown, the rings 5 and 12 may be interconnected also by means of internal cross-beams in the form of a trellis. Finally the scope of the invention includes also the solution whereby the film is subjected to a single pre-stretching action by the initial rollers 25, 125 or by only the final rollers 15, 115, so that there are no problems of contraction while being driven over the aforementioned rollers 10 and 11. It is also understood that the said pre-stretching rollers may be all or partly such that they subject the film to only longitudinal pre-stretching or to both longitudinal pre-stretching and transverse pre-stretching.

Claims

1. Vertical and horizontal axis ring machine, for wrapping with stretch film usually palletized loads which are surrounded by the said ring and in which a suitable displacement between ring and load is envisaged so as to ensure that the latter is wrapped with film over the desired extension, **characterized in that** it comprises:

   - a ring (5) with a diameter suitably greater than that of the maximum-size load (C) to be wrapped, which is made to rotate by drive means (9) mounted on a frame (2) which rotatably supports the said ring by means of support rollers (3) and containing rollers (4);
   - there being mounted on the said frame (2) supporting the ring (5) means for supporting the reel (24) of stretch film and means for unwinding from it the film and for statically supplying it to:
   - conveying means situated on the said rotating ring (5) and controlled by drive means situated on the said support frame (2), for collecting the film supplied from the said static supplying means, so as to keep it in the condition in which it is supplied by these means, so as to accumulate it in the form of annular turns superimposed on each other in an amount greater than that with which the innermost turn of this winding is supplied to the load to be wrapped (C), by supplying means situated on the said rotating ring (5);
   - means (27) for temporarily retaining on the load to be wrapped the front end of the film unwound from the said last supplying means, abandoning the film when the wound turn is suitably fastened thereon, and which at the end of the load wrapping cycle intervene again in order to retain the new front end of the film, separating it from the tail end of the wound turn and fixing the latter onto the said wound turn performed.

2. Machine according to Claim 1), in which the conveying means situated on the rotating ring (5) for collecting and accumulating the film supplied from the said static supplying means comprise a plurality of rollers (10, 11) which are parallel to the axis of the said ring, mounted rotatably at one of their ends on

the said ring (5), with a height suitably greater than that of the film to be collected, and all or partly (10) having a side surface with a high coefficient of friction in relation to the wrapping film, for example a rubberized surface, and being connected together by means of a positive drive transmission and arranged in any suitable way so that they may all be rotated in the same direction and at a same appropriate speed by drive means (23) mounted on the said support frame (2) which in machines with a ring (5) having a vertical axis is actuated with a suitable raising/lowering movement.

3. Machine according to Claim 2), in which the said final supplying means comprise at a short distance from one of the rubberized rollers (10) and kinematically connected to this roller a further pair of rubberized rollers (15, 115) which rotate with a speed ratio such as to subject the film which passes through them to a pre-stretching action of suitable magnitude.

4. Machine according to Claim 3), in which the reel of stretch film (24), which may also have a large diameter, is arranged with a pair of first motor-driven pre-stretching rollers (25, 125, 26) on the said supporting and raising/lowering frame (2), in a position such that the film unwound from the reel and pre-stretched may be deposited on the cage formed by the said rollers (10, 11) supported by the ring, so as to form an accumulating store which allows the film subjected to the first pre-stretching the possibility of reacquiring elastic memory and being able to undergo a second pre-stretching (re-stretching) action upon passing through the said final second pre-stretching rollers (15, 115), upon leaving which the front end of the film is secured to known support means (27) situated on the side of the load to be wrapped.

5. Machine according to Claim 2), in which the vertical-axis ring (5) is mounted rotatably underneath the support frame (2) and the rollers (10, 11) for collecting the film subjected to the first pre-stretching step are supported at one end by the said ring, are directed downwards and at the other end are interconnected by a second ring (12) which in turn may be connected by the upper ring to any internal structures in the form of a trellis.

6. Machine according to Claim 2), in which the ring (5) has an external groove (105) on which at least one closed belt (6) is driven, said belt for a short section being separated from said ring and following a U-shaped path as a result of deflection by a pair of idle pulleys (7) and a driving pulley (8) keyed onto the shaft of a motor (9) supported by a cross-beam (102) of the said frame, which also supports the said idle pulleys (7).

7. Machine according to Claim 2), in which the rollers (10, 11) which collect the film supplied from the static supplying means are of a number such as to form a cage which is polygonal in plan view and has a shape as close as possible to that of a circle and these rollers may all be rubberized or may alternately be rubberized and smooth and may all be motor-driven or motor-driven only partly, the remainder being idle.

8. Machine according to Claim 7), in which the motor-driven rollers (10) are connected together at the top by means of pinions (13) and a chain (14) from which the last pair of rubberized pre-stretching rollers (15, 115) also obtains the driving movement via associated pinions (16, 116), respective pairs of pulleys (18) being keyed onto the shafts of the said motor-driven rollers and other idle pulleys (20) being situated for example on the shafts of the idle rollers (11) and a pair of closed and elastic belts (19) being driven on these pulleys, which belts for a short section follow a U-shaped path as a result of being deflected over pairs of idle rollers (21) and over a driving pulley (22) keyed onto the shaft of an electric motor (23) supported by the same side (102) of the supporting and raising/lowering frame (2) on which the said idle pulleys are mounted.

9. Machine according to Claim 7), in which the motor-driven rollers (10) are connected kinematically by means of a ring with internal teeth which meshes with pinions keyed onto the shafts of the said rollers (10) and which has externally a groove so as to be able to be actuated by the static motor (23) by means of a belt, in the same way as the ring (5), it being envisaged that the final pre-stretching rollers (15, 115) obtain the driving movement from the closest of the rubberized rollers (10) or from a dedicated pinion, by means of a positive drive transmission.

10. Machine according to Claim 3), in which means may be envisaged for ensuring that the motor (23) for rotation of the rollers (10) situated on the rotating ring (5) rotates at a constant speed or at a variable speed, so as to produce a variable supply of film from the final pre-stretching rollers (15, 115), depending on the characteristics and/or the shape and/or the size and/or the non-centred position of the load to be wrapped, it being envisaged that these variables may be entered via suitable means into the working program of the machine or that the latter may be equipped with means and an autodidactic program, at least as regards the shape, the size and the possible offset position of the load.

11. Machine according to Claim 10), **characterized in that**, in order to ensure that the variations in speed of the motor (23) for rotation of the storage rollers (10, 11) cause corresponding variations in accumu-

lation of the material on these rollers, special means may be envisaged for connecting together electrically the shafts of the said motor (23) and that of the motor (26) of the first pair of static pre-stretching rollers (25, 125) or for ensuring that these first pre-stretching rollers are actuated with take-off of the driving movement from the said motor (23).

12. Machine according to Claim 4), in which a mechanical jockey device with one or more rollers may be envisaged downstream of any one or both the pairs of pre-stretching rollers (15, 115, 25, 125).

13. Machine according to Claim 10), in which the weight created in an eccentric position on the ring (5) by the pair of final pre-stretching rollers (15, 115) and by the jockey device, where present, may be counterbalanced by a ballast weight (28) situated on an inner lug (305') of the said ring (5), in a position diametrically opposite to the lug (305) with the said rollers (15, 115).

14. Machine according to Claim 4), **characterized in that**, when a new reel (24) of film is loaded, at least during start-up of the said machine, means may be envisaged for activating a preliminary step during which the front end of the film is not fixed to the gripper (27), but is temporarily fixed to one of the final pre-stretching rollers (115), while the motor (23) is made to rotate at a speed such that the storage rollers (10, 11) do not rotate about their axes, so as to accumulate on these rollers a suitable quantity of film pre-stretched by the first pair of rollers (25, 125), so that the film has time to rest and reacquire sufficient elastic memory for the final re-stretching step, it being envisaged that only subsequently the front end of the film is fixed to the said gripper (27) and the machine is set to perform a normal wrapping cycle, with supplying of the film by the last pre-stretching rollers (15, 115).

15. Machine according to Claim 2), in which the said rollers (10, 11) may be designed to support and to drive external belts (29) or a single band or web, so as to form a continuous-surface conveyor of the closed loop type and made of suitable material with a suitable coefficient of friction in relation to the film and on which the said film rests, thus being prevented from performing both transverse and longitudinal contracting movements.

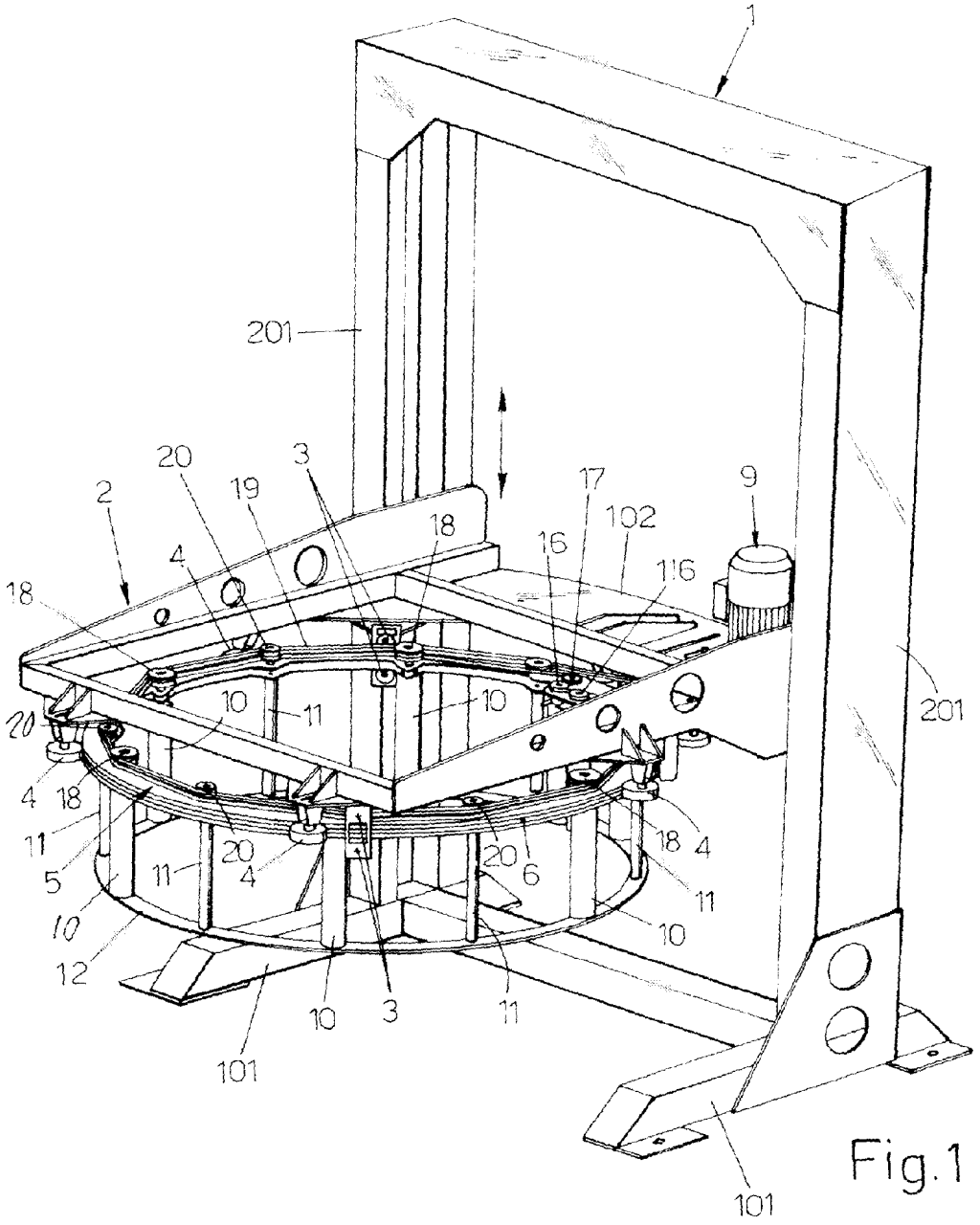
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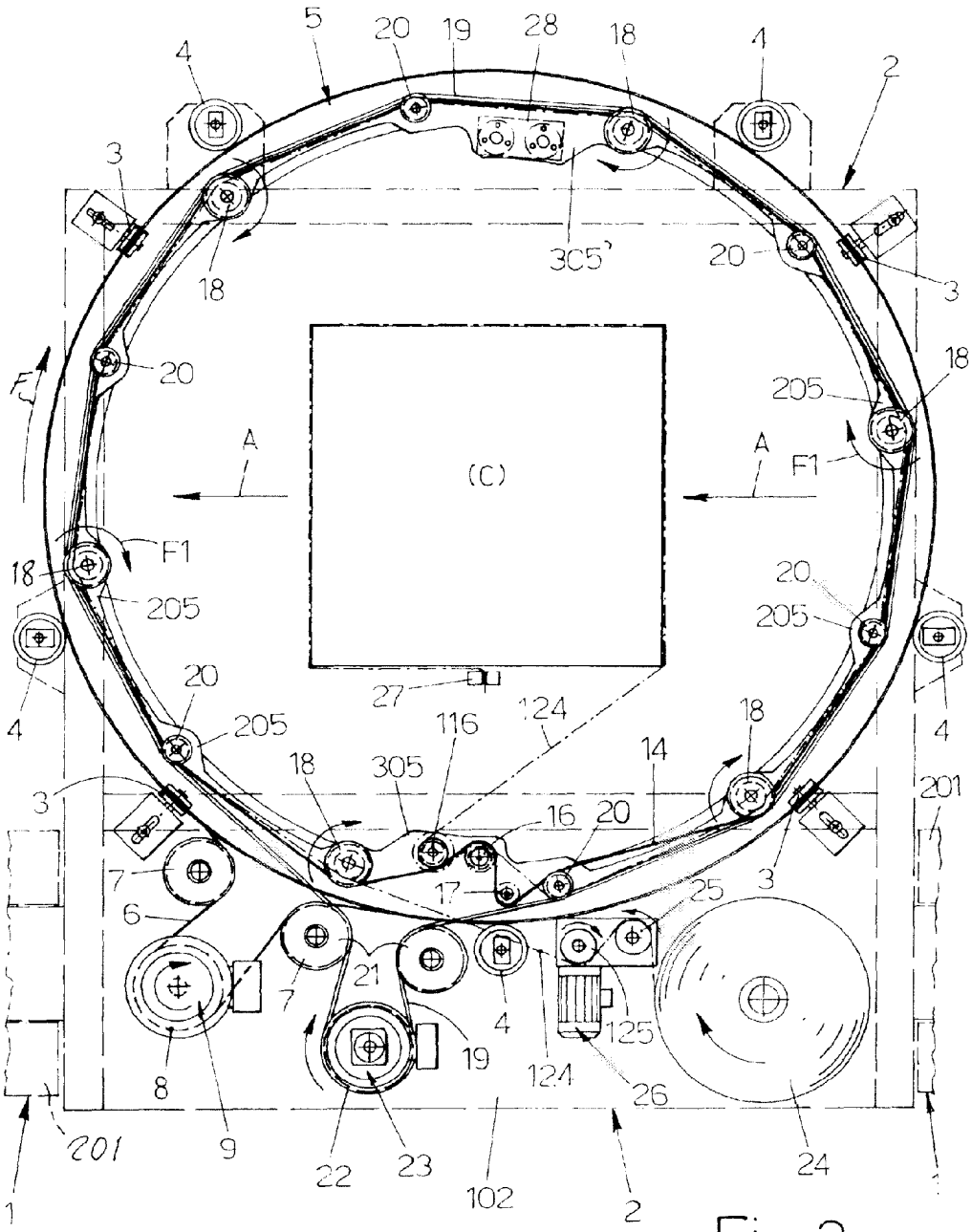
Fig.1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205
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(C)
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124
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124
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201
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23
102
2
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1

Fig.2

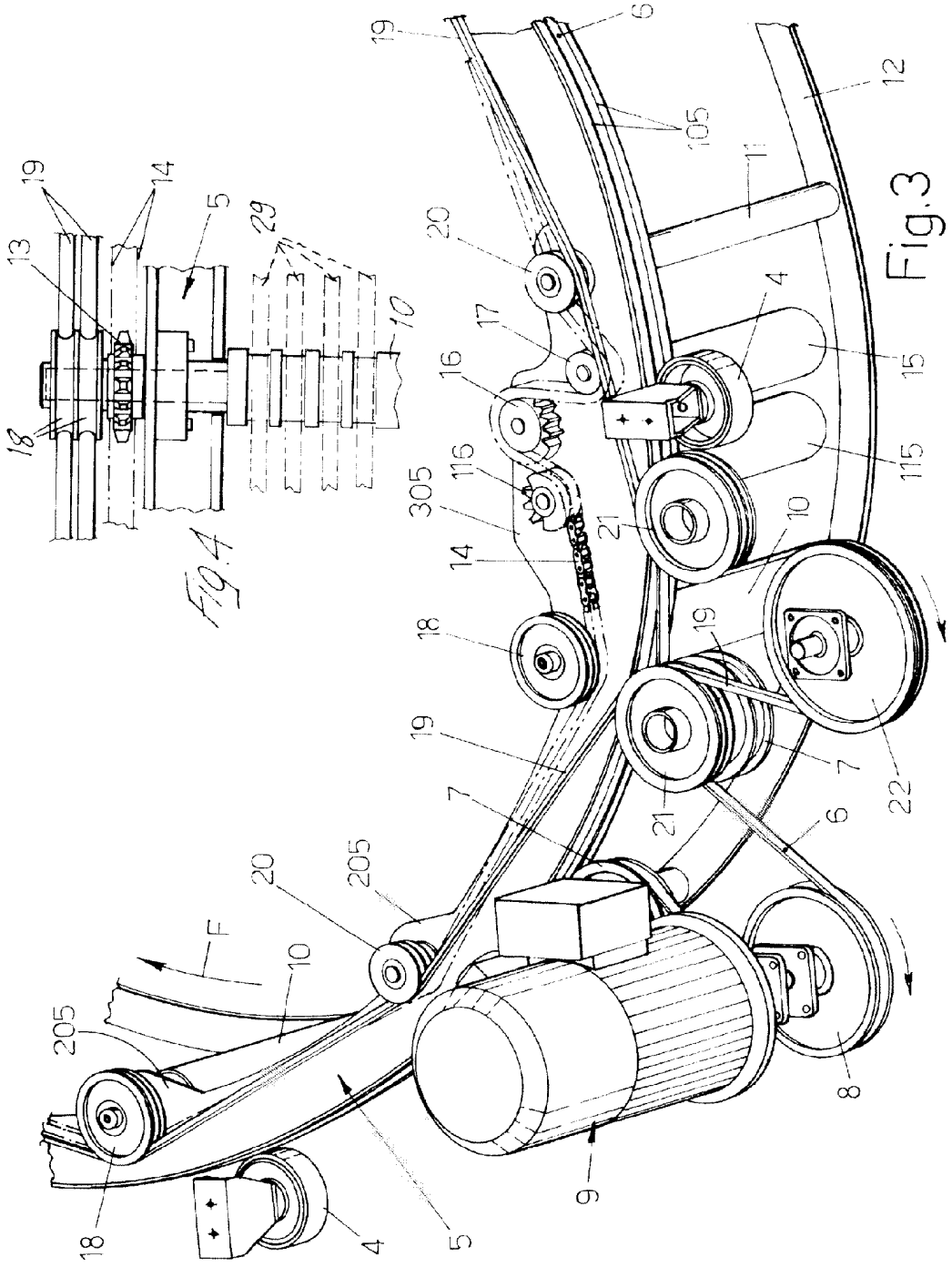
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Fig.3

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Fig.4

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EUROPEAN SEARCH REPORT

Application Number
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2

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